

# The Origin and Development of a Concept: The Information Society\*

BY SUSAN CRAWFORD, *Professor and Director*

*Washington University  
School of Medicine Library  
4580 Scott Avenue  
St. Louis, Missouri 63110*

## ABSTRACT

The constructs that underlie a discipline are complex and often times uncertain. It is argued that the ways in which we perceive and conceptualize are influenced by our habits of mind and our view of the world. This paper traces the concept of the "Information Society" from its inception in the discipline of economics through its development and its subsequent diffusion to the field of information science.

THERE IS a common bond among those who are elected to give the Janet Doe Lecture. First, we are asked to follow in the footsteps of giants—Gertrude Annan, Estelle Brodman, and Frank Rogers, to mention a few. The common bond is exhilaration when we are appointed in May, and then a year of anxiety and pain thereafter.

There are many experiences that one could draw on in more than twenty-five years of administration and stamp with one's own signature. Today, I wish to focus on one small segment of that experience. As editor of the *Bulletin* and, before that, of several other publications, I have had the opportunity to work with many authors. I have seen the origin of ideas, what an author chooses to see, and how he sees it. I wish, therefore, to talk about the genesis and development of a particular concept—its inception and how it has affected our attitudes and our world of application. In this case, I have selected the notion of the "Information Society."

It was about ten years ago that we began to hear about something called the "information society," the "information revolution," and the "information age." We were told that information had the power to change our work patterns and consequently our

life-styles. [1]. One futurist has even said that information had the power to transform us into a utopian society, where diseases would be eliminated and birth control would be universal [2]. Among other things, professionals and technicians would emerge as the pre-eminent social class, replacing business and industrial entrepreneurs [3]. I suppose it is not too hard to imagine David Rockefeller envying librarians. After all, his brother Nelson did catalog Monets and other works of art.

What is this concept of the "information society"? How does it differ from the "knowledge society," the "postindustrial society," and the "mass society"? What do they mean when they talk about an "information revolution"?

## THE INFORMATION SOCIETY

When did people first begin to perceive that information was so important? Scientists have long been aware of the growth of publications, which was one of the justifications for the founding of the Royal Academy in 1660, as documented by Dave Kronick [4]. In the nineteenth century, John Shaw Billings spoke of geometric progression in the growth of medical literature [5]. And certainly, after World War II, there was much discussion on the "information explosion" or the "exponential growth" of publications. But they did not yet use the terms "information society" and "information revolution" with all of their global implications.

One of the earliest writers to introduce this concept was a man named Fritz Machlup, who published a book in 1962 called *The Production and Distribution of Knowledge in the United States* [6]. Dr. Machlup was an economist who was first interested in studying monopoly or the imperfections of competition in a free society.

'Way back in 1933, he observed that certain

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practices restricted competition, for example, the patent system. He then became interested in the cost of the patent system as opposed its benefits, which led to his asking: What portion of the total research and development (R&D) effort do patents make up? Because R&D is closely linked with education, then high-quality education is a precondition to quality research. He therefore had to enquire into the educational system at all levels to find out how the nation produced knowledge—not just scientific and technical information—but all schooling, all college work, and all graduate education had to be included in a comprehensive study of the production of knowledge in the United States.

The steps that led Machlup to make his study of the production of knowledge in the United States may be summarized as follows:

Study of monopoly and competition in a free society, e.g., patent system → Cost of the patent system and its relation to R&D → Cost of R&D and education → Comprehensive study of the production of knowledge in the United States.

By the time Machlup was through, his conceptualization of the entire knowledge effort included the following:

- Research and development
- Education—on all levels
- Communication and its media, e.g., books, journals, radio, television, artistic creation, entertainment
- Information machines, e.g., computers, electronic data processing, telecommunication, office machines
- Information services, e.g., libraries and information centers; that portion of governmental, legal, financial, engineering, and medical services that are dependent upon information.

This in turn led to a quantitative study of the share of information as a component of the gross national product of the United States. So Machlup began with a study of the theory of competition and monopoly and ended up with a statistical investigation of knowledge production in the United States. This took him some thirty years.

And what did Machlup find? With this aggregate definition of knowledge production: education, various printed and electronic media, artistic creation, telecommunication, postal services, and information technology—and thrown into all of this, the cost of students being in school instead of

working—he came up with some astounding statistics in 1962.

1. The aggregate knowledge production made up 29% of the adjusted gross national product (GNP);
2. The rate of growth was projected at 2.5 times the average growth rate of other components of the total GNP, and knowledge production would soon reach 50% of the GNP.
3. The total civilian labor force engaged in knowledge-producing activities was equal to 31.6% in 1969, and if full-time students of working age were added, the total labor force would be equal to 42.8% of the population.

The book had quite an effect. Machlup called the aggregate effort the “knowledge industry” and, by implication, the university that is at the center of knowledge production and teaching was equated to an industry. This upset some people. Students and professors charged Machlup with having called the large university a “knowledge factory” [7].

But in general, the book was praised. The *Political Science Quarterly* [8], the *American Economic Review* [9], and the *Journal of Political Economy* [10], all prestigious publications, had favorable reviews. Finally, Clark Kerr, then president of the University of California, Berkeley, cited Machlup’s notion of the “knowledge industry” in concert with Abraham Flexner’s “idea of a modern university” [11]. Then it was caught up in the more widely circulated media. Kenneth Boulding wrote about it in *Challenge* [12] and Gilbert Burck reviewed it in *Fortune* [13]. Then it was translated into Russian and Japanese.

Machlup’s work led to publications by a series of other authors. In 1969, Peter Drucker, in his best-selling book *The Age of Discontinuity*, wrote a section on “The Knowledge Society,” based upon Machlup’s data and projections [14]. Drucker added that, by the late 1970s, the knowledge sector would account for one half of the GNP. That did it. The *knowledge/information society* was born. By 1970, the term with its variants began to appear in the library/information science literature. In 1970, the theme for the annual meeting of the American Society for Information Science was “The Information-Conscious Society” and one paper addressed the “Advent of the Information Age” [15].

*The Coming of the Post-Industrial Society*, by Daniel Bell, issued in 1973, was an immensely popular book [16]. In the postindustrial society, the

providing of services eclipsed agriculture and manufacturing as a portion of the GNP. Central to the postindustrial society are the emergence of knowledge, information, and planning as pre-eminent activities.

In 1976, Edwin Parker claimed that the world was on the brink of a new social revolution, that is, an information revolution that will be as important as the industrial revolution of the nineteenth century [17]. Perhaps the next most important contribution was made by Marc Porat, who completed a doctoral dissertation in 1977 on the "information economy." In this work, he quantified the concepts of Machlup [18]. Porat took U.S. Department of Commerce data on national income and product accounts and analyzed these in terms of the cost of information activities.

#### INDUSTRIAL SECTORS AND THE GROSS NATIONAL PRODUCT

So far, we have discussed the genesis of a concept and the process by which it has diffused so that it became a common term. Let us pause now and discuss the rationale behind the knowledge/information society. I borrow heavily from my former colleague from the University of Chicago, Michael Cooper, now at Berkeley, who has made a masterful analysis of this area [19].

Machlup, Porat, and Bell argue that we shifted from an *agricultural economy* to an *industrial economy* during the nineteenth century. After World War II, they continue, we evolved into a *service economy*. Now, we have become an *information economy*. To understand the reasoning behind these shifts, it is necessary to discuss the way in which the U.S. government prepares its national income accounting and calculates the GNP.

In calculating the GNP index, each organization in the United States is classified by the type of service or product it supplies. To simplify the explanation, I will adapt Cooper's consolidation of the major industrial sectors into four:

- Agriculture;
- Industry: mining, construction, manufacturing, transportation, communications, public utilities;
- Services: wholesale and retail trade, finance, insurance, real estate;
- Government: federal, state, local.

Figure 1 shows the growth of these four sectors from 1947 to 1980 as a percentage of the GNP. Agriculture (bottom line) makes up the smallest portion of the GNP, falling from 4% in 1947 to

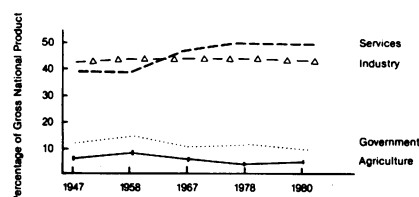


FIG. 1—Economic sectors as a percentage of the gross national product (in 1972 dollars). From Cooper [19].

2.7% in 1980. Government (dotted line) and industry (delta dash line) also declined during these twelve years. Only the service sector (dash line) has increased, from 39% to almost 45%. What is interesting is that after 1958, services exceeded industry as a percentage of the GNP. This is where the two lines on the top intersect. Thereafter, services make up the largest portion of the GNP. This is what is meant by shifting from an industrial economy to a service economy.

Early in the history of the United States, agriculture and mining were the major industries; later, manufacturing surpassed agriculture as a portion of the GNP, and after World War II, services in turn surpassed manufacturing. If we look at employment trends, we will also find that, beginning in 1958, the total number of service workers also exceeded the total number of industrial workers.

The question we now ask is: Has there been a shift from the service economy to the information economy? In other words, do information activities now make up a larger portion of the GNP than do services? The question is a hard one to answer because the federal government does not have a definition for "information industry" and does not analyze information activities as a portion of the GNP.

Machlup and Porat define the information economy differently. They address the same general topics, but their approaches differ. The knowledge/information society is viewed by both as an aggregate concept with an economic base. Both view information as a commodity made up of goods and services that have costs as they are created and that can be bought and sold. To recapitulate: included are education of all kinds; R&D; libraries and information centers; entertainment and the arts; goods, such as paper, pens, typewriters, and computers; and that portion of such services as accounting, medicine, and law that depend upon information. For each of these activities, labor costs, materials costs, and overhead are included. Table 1 compares the two approaches.

TABLE 1  
DEFINITIONS OF THE INFORMATION ECONOMY: MACHLUP AND PORAT

| Machlup (1962)   | Porat (1977)   |
|--|--|
| 1. Basic units are <i>organizations</i> and <i>individuals</i> that produce information goods and services, e.g., industrial firms, institutions, departments, individuals/households.                                 | 1. Basic units are <i>information activities</i> . Porat examines each activity to see if it is information-related, then ascribes costs to that activity. There is a <i>primary</i> sector whose major activity is information; and a secondary sector with only some information activity. |
| 2. Objective: to regroup these into 5 sectors (education, research and development, communications, information services, information machines) to describe the scope of the information economy and to ascribe costs. | 2. Objective: to measure the information economy by reformatting costs into U.S. National Accounting categories.   |
| 3. Total: 28.5% of gross national product.   | 3. Total: 25% of gross national product.   |

*Machlup's* basic units are *organizations* or *individuals* that produce knowledge, information goods, and related services. Machlup tries to regroup these to describe the scope of the information economy and then to determine costs. One might question some of Machlup's assumptions. His concept of education is broad and bears little relationship to how the federal government measures educational expenditures; for example, the cost of education in the home includes wages that parents would be earning if they worked instead of staying at home.

*Porat's* basic unit is *information activity*. In brief, he examines each activity, and if it is information-related, ascribes costs to that activity. The costs are then reformatted according to U.S. National Income Accounting categories.

It is on this basis that Machlup calculated in 1962 that information products and services made up 28.5% of the gross national product, whereas Porat's estimate was around 25%. Information activities, as they define them, make up a significant portion of our economy.

It should be noted that, in the information economy, the traditional library plays a very small role. Porat relegates libraries to a subset of public information services under the category "Information Distribution and Communication Industries." Machlup had plans to update his 1963 work and to expand it to eight volumes. Volume 6, entitled "Information Services and Information Machines" was to contain some parts on libraries. But before he could finish volume 2, Machlup, who was by then 80 years old, died in February 1983. Whether we accept these views of the library depend, of course, on our concept of their role. Certainly, the Matheson report on the role of libraries in aca-

demic centers does not reflect the restricted traditional view [20].

Our next question is: What is the trend in distribution of GNP among the economic sectors, if we include the information sector? Are information services and products increasing or decreasing in comparison with agriculture, industry, and services? Porat has compiled data for 1929 through 1972. As indicated in Table 2, the average annual growth rate for these years in constant dollars is indeed highest in the information sector at 6% to 10% in comparison with the government sector and the services sector [21]. But, what is interesting is that an update of Porat's analysis showed that the information sector had actually declined from 25.1% of the GNP in 1967 to 24.8% in 1972 [22]. Cooper projects a leveling off in the future [23].

What does all of this add up to? Two economists have regrouped the outputs of existing industries, and were able to form a new "information" category. Some of the outputs or activities are new, in the

TABLE 2  
AVERAGE ANNUAL GROWTH RATE OF INDUSTRY, SERVICES, GOVERNMENT AND INFORMATION SECTORS, 1948-1972

| Sector      | Average Annual Growth Rate, % |
|-------------|-------------------------------|
| Government  | 5.0                           |
| Industry    | 5.4                           |
| Services    | 6.5                           |
| Information | 6-10*                         |

\*Derived from constant dollars, i.e., adjusted for inflation. As no time series are available to deflate the values in the information sector, the percentage growth in this sector is estimated. Adapted from Cooper [19].

sense that they did not exist in previous years. But many of the outputs, such as education, entertainment, and the arts, have existed for a long time, and are regrouped into the new information sector. As Cooper summed it up:

The evidence suggests that the concept of an information economy is new but many of the products and services in it are the same. It is not clear that there has been a shift from a services to an information economy, rather than a relabeling of existing products and services [24].

#### DISCUSSION

I have chosen this analysis of the "information society" to share with you a few observations about our own field. First, I have tried to demonstrate the complexity of the ideas we are working with by tracing the origin of the concept. I have followed its diffusion from the specialty of economics, where it was first abstracted, to the information field. Very rapidly, it caught on in the mass media, where it has been endowed with many meanings and treated and mistreated. Second, I have observed the indiscriminate use of concepts and terminology for many years, especially when they become the current vogue. In outlining the derivation of this global term, I hope that you will now understand its scope and restrictions—and use it with care.

On another level, I have shown how the ways in which we perceive and conceptualize are influenced by our habits of mind and by our view of the world. It would have been difficult for someone in the library field to perceive of information activities as did these two economists.

Bertrand Russell once remarked that animals used in psychological research tend to display the national characteristics of the observer. Animals studied by Americans rush about frantically, with an incredible display of hustle and pep, and then at last achieve the desired result by chance. Animals observed by Germans sit still and think, and finally solve the problem out of their inner consciousness [25]. This half-serious observation tells a lot about how we simultaneously influence our environment and how we are bound by our conventions. We measure the size of the world by the way we perceive it.

Although we may disagree in some aspects with Machlup and Porat, we cannot fault them on the introduction of powerful, new ideas. They have provided a framework for viewing the extent of information activities in our society and their share in our economy. Finally, from this segment of my experience, I argue that the diversity of viewpoints,

as they reflect the diversity of minds, is what makes the profession rich and what makes it grow.

In closing, I want to add that, in this lecture, I have not touched upon another important aspect: the role of the new information technologies. Here, I am referring to the consequences of computers and communications technology. There is no question that these technologies will have a massive effect on greater numbers of people; they will be used as powerful political tools; they will augment the human senses; and finally they may even affect the structure and content of our culture. But I will leave this area to a Janet Doe lecturer of the future.

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